

**Amendments to the Claims:**

The following listing of claims will replace all prior versions, and listings, of claims in the application:

- A1
1. (Currently Amended) An image rendering system comprising:  
a scanner that scans an image and produces image data;  
an encoder that is coupled to the scanner and encodes the image data to provide encoded image data including anti-aliased grayscale text or lineart data that includes an identification of boundary pixels and associated pixel values, wherein the encoder separates the boundary pixels into interior boundary pixels and exterior boundary pixels; and  
a decoder that is coupled to the encoder and decodes the encoded image data to provide decompressed data including anti-aliased text or lineart data and renders the decompressed data.
  2. (Original) The image rendering system of claim 1, wherein the system implements an MRC image architecture.
  3. (Original) The image rendering system of claim 1, further comprising memory that is coupled to the encoder and decoder and that stores the encoded image data, the memory being coupled to the decoder.
  4. (Original) The image rendering system of claim 1, wherein the scanner scans an image and produces high resolution grayscale data, and wherein the encoder separates the grayscale pixels of the high resolution grayscale data into boundary pixels and non-boundary pixels, individually derives values of grayscale boundary pixels using the high resolution grayscale data, and stores the individually derived values of the grayscale boundary pixels.
  5. (Original) The image rendering system of claim 4, wherein the encoder compresses the individually derived values of the grayscale boundary pixels as part of a set of

grayscale tokens that represent connected components in a foreground image that is part of the scanned image data.

6. (Original) The image rendering system of claim 5, wherein the image data is color image data and a foreground image and a background image of the scanned image data are represented by low-resolution color data.

7. (Original) The image rendering system of claim 5, wherein, during compression, the encoder selects the boundary pixels from the scanned image data, quantizes the boundary pixels and analyzes each token as both a foreground layer and a boundary layer.

8. (Original) The image rendering system of claim 7, wherein the foreground layer and the boundary layer are compressed separately.

9. (Original) The image rendering system of claim 5, wherein only one set of boundary pixels is stored for each token.

10. (Original) The image rendering system of claim 6, wherein, for each high resolution color boundary pixel on a token, three colors are stored as three grayscale values.

11. (Original) The image rendering system of claim 10, wherein each grayscale value is computed as a fraction of an intensity between the foreground image and the background image.

12. (Original) The image rendering system of claim 10, wherein grayscale values of the boundary pixels are used to interpolate between foreground and background images during rendering of the image data.

13. (Original) The image rendering system of claim 12, wherein the three grayscale values are used for interpolation between foreground and background pixels on the boundary pixels of each instance of the token.

14. (Currently Amended) The image rendering system of claim 4, wherein ~~the step of storing~~the scanner stores the individually derived values of the grayscale boundary pixels ~~includes~~by storing at least a full image mask corresponding to the scanned image data.

15. (Currently Amended) The image rendering system of claim 1, wherein the scanner scans the image and produces high resolution grayscale data and the encoder separates the grayscale pixels of the high resolution grayscale data into boundary pixels and non-boundary pixels, ~~separates the grayscale boundary pixels into interior boundary pixels and exterior boundary pixels~~, determines boundary pixel connectedness for both the interior boundary pixels and the exterior boundary pixels, determines a representative grayscale value for the interior boundary pixels and a representative grayscale value for the exterior boundary pixels based on the connectedness of the interior boundary pixels and the exterior boundary pixels respectively and stores the grayscale values for the boundary pixels.

16. (Original) The image rendering system of claim 15, wherein the encoder stores the individually derived values of the grayscale boundary pixels by compressing the individually derived values of the grayscale boundary pixels as part of a set of grayscale tokens that represent connected components in a foreground image that is part of the scanned image data.

17. (Original) The image rendering system of claim 1, wherein the scanner scans the image and produces high resolution binary data and the encoder individually estimates median boundary pixel values based on a number of oppositely colored four neighbor pixels to each of the boundary pixels and stores the estimated median boundary pixel values.

18. (Original) The image rendering system of claim 17, wherein the encoder stores the estimated median boundary pixel values by compressing the estimated median boundary pixel values as part of a set of grayscale tokens that represent connected components in a foreground image that is part of the scanned image data.

19. (Original) The image rendering system of claim 18, wherein the decoder performs rendering of the grayscale tokens by analyzing a connectivity of the boundary pixels and performing grayscale substitutions.

20. (Original) The image rendering system of claim 19, wherein substitution values used during performing grayscale substitutions are known a priori.

21. (Original) The image rendering system of claim 17, wherein the encoder stores the estimated median boundary pixel values by compressing the estimated median boundary pixel values as part of a foreground mask that represents connected components in a foreground image that is part of the scanned image data.

22. (Original) The image rendering system of claim 21, wherein the decoder performs rendering of the foreground mask by analyzing a connectivity of the boundary pixels and performing grayscale substitutions.

23. (Currently Amended) The image rendering system of claim 1, wherein the scanner scans the image and produces high resolution binary data and the encoder separates the boundary pixels into interior boundary pixels and exterior boundary pixels.

24. (Original) The image rendering system of claim 23, wherein the encoder determines a first global grayscale value corresponding to the interior boundary pixels and a second global grayscale value corresponding to the exterior boundary pixels and stores the interior and exterior boundary pixel data including the first and second grayscale boundary pixel values.

25. (Cancelled)

26. (Original) The image rendering system of claim 24, wherein the first and second default global values are determined based on analysis of image data other than the scanned image data.

27. (Currently Amended) The image rendering system of claim 23, wherein the decoder renders the image using the interior and exterior boundary pixel values and the ~~binary~~ high resolution binary data.

28. (Original) The image rendering system of claim 1, wherein the scanner scans the image and produces very high resolution binary data and the encoder converts the very high resolution binary data to high resolution grayscale data and stores the high resolution grayscale data.

29. (Original) The image rendering system of claim 28, wherein the encoder stores the high resolution grayscale data by compressing the high resolution grayscale data as part of a set of grayscale tokens that represent connected components in a foreground image that is part of the scanned image data.

30. (Currently Amended) An image rendering method comprising:  
scanning an image to obtain scanned image data including text or lineart data;  
generating an anti-aliased grayscale version of the text or lineart data  
including determining pixel values of the boundary pixels in the anti-aliased grayscale version of the scanned text or lineart data;

separating the pixels into boundary pixels and non-boundary pixels;  
rendering the image using the determined pixel values.

31. (Currently Amended) The image rendering method of claim 30, wherein:  
~~the step of scanning the image comprises producing~~ producing high resolution grayscale data; and

generating ~~an~~ the anti-aliased grayscale version of the text or lineart data  
further comprises:

individually deriving values of grayscale boundary pixels using the high resolution grayscale data, and

storing the individually derived values of the grayscale boundary pixels.

32. (Cancelled)

33. (Cancelled)

34. (Cancelled)

35. (Cancelled)

36. (Cancelled)

37. (Cancelled)

38. (Cancelled)

39. (Currently Amended) The image rendering method of claim 31, wherein ~~the step of~~ storing the individually derived values of the grayscale boundary pixels includes storing a full image mask corresponding to the scanned image data.

40. (Currently Amended) The image rendering method of claim 30, wherein: ~~the step of~~ scanning the image comprises producing high resolution grayscale data; and

~~the step of~~ generating an anti-aliased grayscale version of the text or lineart data comprises:

~~separating the grayscale pixels of the high resolution grayscale data into boundary pixels and non-boundary pixels;~~

separating the grayscale boundary pixels into interior boundary pixels and exterior boundary pixels;

determining grayscale boundary pixel connectedness by separately analyzing the interior grayscale boundary pixels and the exterior grayscale boundary pixels;

individually deriving values of grayscale boundary pixels using the high resolution grayscale data and the determined grayscale boundary pixel connectedness;<sub>2</sub> and

storing the individually derived values of the grayscale boundary pixels.

41. (Currently Amended) The image rendering method of claim 40, wherein ~~the step of~~ storing the individually derived values of the grayscale boundary pixels includes compressing the individually derived values of the grayscale boundary pixels as part of a set of grayscale tokens that represent connected components in a foreground image that is part of the scanned image data.

42. (Original) The image rendering method of claim 41, wherein at least one of a token index, location, color, character and font ID and anti-aliasing information are stored with each token instance.

43. (Currently Amended) The image rendering method of claim 41, wherein ~~the step of~~ rendering is performed by rendering grayscale tokens by analyzing a connectivity of the boundary pixels and performing grayscale substitutions.

44. (Currently Amended) The image rendering method of claim 30, wherein ~~the step of~~ scanning the image comprises producing high resolution binary data; and ~~the step of~~ generating ~~an~~ the anti-aliased grayscale version of the text or lineart data comprises:

individually estimating median boundary pixel values based on a number of oppositely colored four neighbor pixels to each of the boundary pixels;<sub>2</sub> and  
storing the estimated median boundary pixel values.

45. (Currently Amended) The image rendering method of claim 44, wherein ~~the step of~~ storing the estimated median boundary pixel values ~~stores~~ comprises storing the

estimated median boundary pixel values as part of a set of grayscale tokens that represent connected components in a foreground image that is part of the scanned image data.

46. (Original) The image rendering method of claim 45, wherein at least one of a token index, location, color, character and font ID and anti-aliasing information are stored with each token instance.

47. (Currently Amended) The image rendering method of claim 45, wherein ~~the step of rendering~~ is performed by rendering the grayscale tokens by analyzing a connectivity of the boundary pixels and performing grayscale substitutions.

48. (Original) The image rendering method of claim 47, wherein substitution values used during performing grayscale substitutions are known a priori.

49. (Currently Amended) The image rendering method of claim ~~32~~30, wherein ~~the step of scanning the image~~ comprises producing high resolution binary data; and ~~the step of generating an~~the anti-aliased grayscale version of the text or lineart data comprises:

separating the boundary pixels into interior boundary pixels and exterior boundary pixels;

determining a first global grayscale value corresponding to the interior boundary pixels and a second global grayscale value corresponding to the exterior boundary pixels; and

storing the interior and exterior boundary pixel data including the first and second grayscale boundary pixel values.

50. (Currently Amended) The image rendering method of claim 49, wherein ~~the step of storing the interior and exterior boundary pixel data~~ storescomprises storing the interior and exterior boundary pixel data as part of a set of grayscale tokens that represent connected components in a foreground image that is part of the scanned image data.



51. (Original) The image rendering method of claim 50, wherein at least one of a token index, location, color, character and font ID and anti-aliasing information are stored with each token instance.

52. (Currently Amended) The image rendering ~~system~~method of claim 49, further comprising storing default global grayscale values including first and second default global grayscale values and setting the interior boundary pixels to the first default global grayscale value and setting the exterior boundary pixels to the second default global grayscale value.

53. (Currently Amended) The image rendering ~~system~~method of claim 52, wherein the first and second default global values are determined based on analysis of image data other than the scanned image data.

54. (Original) The image rendering method of claim 49, further comprising rendering the image using the interior and exterior boundary pixel values and the binary high resolution data.

55. (Currently Amended) The image rendering method of claim 30, wherein ~~the step of scanning the image~~ comprises producing very high resolution binary data; and

~~the step of generating an~~the anti-aliased grayscale version of the text or lineart data comprises:

converting the very high resolution binary data to high resolution grayscale data; and

storing the high resolution grayscale data.

56. (Currently Amended) The image rendering method of claim 55, wherein ~~the step of storing the high resolution grayscale data~~ includes compressing the high resolution grayscale data as part of a set of grayscale tokens that represent connected components in a foreground image that is part of the scanned image data.

57. (Original) The image rendering method of claim 56, wherein at least one of a token index, location, color, character and font ID and anti-aliasing information are stored with each token instance.

58. (Currently Amended) The image rendering method of claim 55, wherein ~~the converting step is performed by~~ the very high resolution binary data comprises filtering and down sampling the very high resolution binary text or lineart data to produce the high resolution grayscale text or lineart data.

59. (Currently Amended) The image rendering method of claim 58, wherein ~~the step of~~ filtering and down sampling comprises: tiling the very high resolution binary text or lineart data prior to subsampling the very high resolution binary text or lineart data, and calculating a gray value for each tile that is proportional to the number of pixels of a first value in the tile.

60. (New) An image rendering system comprising:  
a scanner that scans an image and produces image data and high resolution binary data;

an encoder that is coupled to the scanner and encodes the image data to provide encoded image data including anti-aliased grayscale text or lineart data that includes an identification of boundary pixels and associated pixel values, wherein the encoder separates the boundary pixels into interior boundary pixels and exterior boundary pixels; and

a decoder that is coupled to the encoder and decodes the encoded image data to provide decompressed data including anti-aliased text or lineart data and renders the decompressed data, wherein the decoder stores default global grayscale values including first and second default global grayscale values and sets the interior boundary pixels to the first default global grayscale value and sets the exterior boundary pixels to the second global default grayscale value.

61. (New) An image rendering method comprising:

scanning an image to obtain scanned image data including text or lineart data, wherein scanning the image produces high resolution grayscale data;

generating an anti-aliased grayscale version of the text or lineart data, comprising:

separating the grayscale pixels of the high resolution grayscale data into boundary pixels and non-boundary pixels,

individually deriving values of grayscale boundary pixels using the high resolution grayscale data, and

storing the individually derived values of the grayscale boundary pixels, including compressing the individually derived values of the grayscale boundary pixels as part of a set of grayscale tokens that represent connected components in a foreground image that is part of the scanned image data; and

rendering the image using the individually derived pixel values.

62. (New) The image rendering method of claim 61, wherein storing the individually derived values of the grayscale boundary pixels further comprises:

storing at least one of a token index, location, color, character, font ID, and anti-aliasing information with each token instance.

63. (New) The image rendering method of claim 61, further comprising:

scanning an image to obtain scanned color image data; and

representing a foreground image and a background image of the scanned color image data by low-resolution color data.

64. (New) The image rendering method of claim 63, further comprising:

storing three colors as three grayscale values for each high resolution color boundary pixel on a token.

65. (New) The image rendering method of claim 64, further comprising:  
determining each grayscale value as a fraction of an intensity between the foreground image and the background image.

66. (New) The image rendering method of claim 64, wherein rendering the image further comprises:  
interpolating between foreground and background images using grayscale values of the boundary pixels.

67. (New) The image rendering method of claim 64, further comprising:  
interpolating between foreground and background pixels on the boundary pixels of each instance of each token using the three grayscale values.

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